

Retrofitting Existing Classrooms

A classroom designed without regard to good acoustics will often include a tall plaster or drywall ceiling, drywall or other masonry walls and a hardwood or tile floor. Unfortunately, numerous classrooms of this description were built in the past before the days of acoustical concern. In this type of classroom, reverberation and echoes may significantly reduce speech intelligibility, especially for younger children.

Acoustical problems in existing classrooms can be solved, but the options are often limited. That's because little can be done to change the architectural infrastructure without great expense. For example, it's difficult to reduce the

transmission loss of walls inexpensively, other than sealing as many openings as possible.

Other than replacing the system, the ability to reduce HVAC noise is also limited. Installing silencers in the ductwork, and vibration silencers under the equipment, are two possible solutions. Consequently, the most common and affordable solution is to control reverberation time through the addition of sound absorptive materials.

Installation of an acoustical ceiling in a classroom that does not already have one will greatly reduce reverberation time. As noted earlier, reverberation time is affected by the volume of the room and the amount of absorptive surfaces within it. The addition of an acoustical

ceiling decreases the volume of the room and increases the amount of absorptive materials at the same time.

If a suspended ceiling is already in the room, check the acoustical values of the ceiling panels. Replacing them with panels with a higher NRC value will improve the acoustical environment. The addition of appropriate wall treatment will further improve it, as will the addition of carpeting. And, if possible, adding a pane of glass to the windows will help block exterior noise.

If a classroom is designed correctly at the time of construction, the addition of these acoustic treatments does not add significantly to the construction cost. When they are included as part of a retrofit is when additive costs usually apply.

Acoustical Treatment Earns an A+

case study

A test conducted by Armstrong with architect Micaelina Campos illustrates the effect of acoustical treatment in an existing classroom. Teachers in a local school were complaining about the vocal effort required to teach. The problem was a very high reverberation time and a high level of background noise from the street. Campos recommended an acoustical treatment, and offered to conduct a test to see if the proposed solution would work.

She selected four essentially identical classrooms. The design of the rooms was typical for the area, namely, hardwood floors, masonry walls, high masonry ceilings and tall windows. Campos treated two rooms acoustically, and left the other two untreated to function as "control" rooms.

To improve the acoustical

environment in the treated rooms, Campos employed a three-step solution: installation of a suspended ceiling with an NRC of 0.70; application of a wall treatment across the top portion of the back wall; and a reduction in the size of the windows followed by the installation of a second pane of glazing.

The acoustical results of the treatment were dramatic: Reverberation time went from 2.6 seconds to 0.6 seconds, and the level of background noise went from 66 decibels during peak street noise hours to a low of 38 decibels.

However, acoustical results were not the only measures of success. A number of subjective factors were also investigated. For example, teachers were asked how they felt

after teaching in the treated classrooms. There was an 80% increase in the level of satisfaction. Fewer voice problems was one of the most common reasons given.

Reinforcing this finding was the fact that school officials noted that before acoustical treatment, 57.5% of total teacher absences were due to voice/throat problems. After treatment, only 34.7% were due to the same problem.

However, the most telling measure of success came from parents, who, after moving their weekly association meetings from one of the non-treated classrooms to a treated one, decided to conduct all their subsequent meetings in the treated classroom, and to install acoustical treatments in the remainder of the classrooms.